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Shuttle to carry powerful X-ray telescope into orbit

By John Ira Petty

The Chandra X-ray Observatory, the world's most powerful X-ray telescope, will be launched aboard *Columbia* on STS-93. Chandra's mission is to offer new insights into the nature of the universe.

Chandra, formerly called the Advanced X-ray Astrophysics Facility, will join two other great NASA observatories in orbit. In terms of its energy sensing range, it will fall between the Hubble Space Telescope, launched in 1990 to study visible and ultraviolet light sources, and the Gamma Ray Observatory, launched in 1991.

The observatory is named for Subrahmanyan Chandrasekhar, who died in 1995 at age 85. Widely known as Chandra, he was regarded as a leading astrophysicist of this century. The Nobel laureate's discoveries are basic to modern astrophysics.

The Chandra Observatory will be available to U.S. and international scientists. It is designed to determine the nature of celestial objects, from normal stars to quasars, to understand the physical processes which take place in and between astronomical objects. More basically, it's goal is to understand the history and evolution of the universe.

"With greater resolution and higher sensitivity than any previous X-ray telescope, this observatory will provide us with a new perspective of our universe," said Dr. Martin Weisskopf of Marshall Space Flight Center, the project's chief scientist.

Marshall manages development of the observatory for the Office of Space Science at NASA Headquarters.

"We'll be able to study sources of X-rays throughout the universe, like colliding galaxies and black holes, many of which are invisible to us now," Weisskopf said. "We may even see the processes that create the elements found here on Earth."

Among questions the observatory is expected to help answer are the age and size of the universe. It also will probe the nature and amounts of "dark matter," one of nature's great puzzles.

The observatory will allow scientists to see and measure the details of hot gas clouds in clusters of galaxies and to observe X-rays generated when stars are torn apart by the incredibly strong gravity around massive black holes in the centers of galaxies. It will provide images that will help understand how exploding stars create and disperse many of the elements necessary for new stars, planets, and life.

Cosmic X-rays are produced by violent events such as stars exploding or galaxies colliding. X-rays also are emitted by matter heated to many millions of degrees as it swirls toward a black hole. The only way to observe these and other extremely hot astronomical sources is with a space-based X-ray telescope.

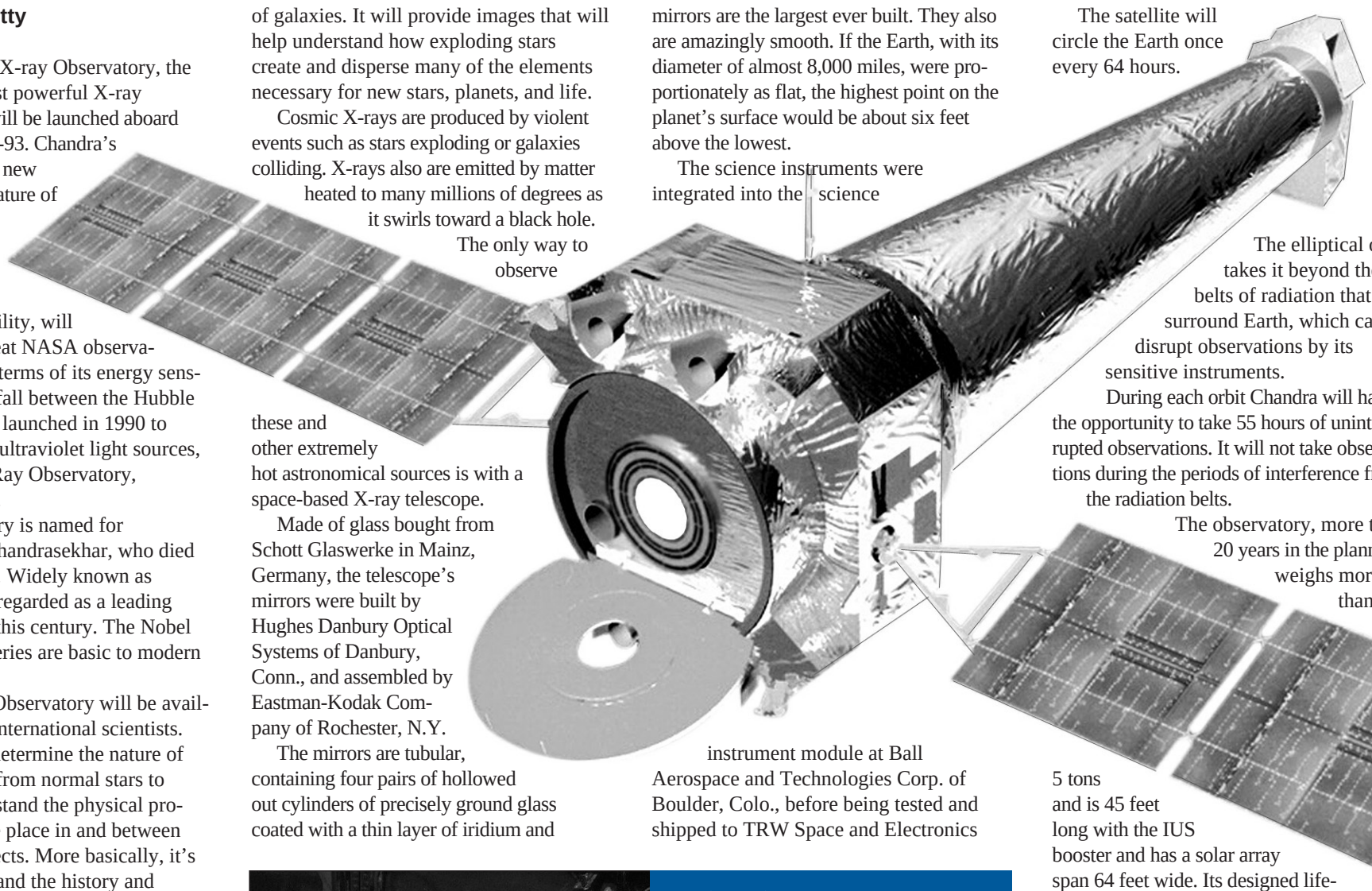
Made of glass bought from Schott Glaswerke in Mainz, Germany, the telescope's mirrors were built by Hughes Danbury Optical Systems of Danbury, Conn., and assembled by Eastman-Kodak Company of Rochester, N.Y.

The mirrors are tubular, containing four pairs of hollowed out cylinders of precisely ground glass coated with a thin layer of iridium and nested inside one another because of the very short wavelength of X-rays. Flat mirrors would absorb X-rays, but they are reflected if they encounter an angled surface.

The mirrors are aligned to focus individual X-ray photons on a point 30 feet behind them. Weighing about 2,000 pounds, the mirrors are the largest ever built. They also are amazingly smooth. If the Earth, with its diameter of almost 8,000 miles, were proportionately as flat, the highest point on the planet's surface would be about six feet above the lowest.

The science instruments were integrated into the science instrument module at Ball Aerospace and Technologies Corp. of Boulder, Colo., before being tested and shipped to TRW Space and Electronics Group for final integration into the spacecraft. TRW is NASA's prime contractor for the observatory.

After deployment from *Columbia* at 155 miles above the surface, Chandra will be lifted to an elliptical orbit of 800 by 83,000 miles by an Inertial Upper Stage booster.



The satellite will circle the Earth once every 64 hours. The elliptical orbit takes it beyond the belts of radiation that surround Earth, which can disrupt observations by its sensitive instruments.

During each orbit Chandra will have the opportunity to take 55 hours of uninterrupted observations. It will not take observations during the periods of interference from the radiation belts.

The observatory, more than 20 years in the planning, weighs more than 5 tons and is 45 feet long with the IUS booster and has a solar array span 64 feet wide. Its designed lifetime is a minimum of five years.

JSC Photo S98-10987

> ***My crew and I have been preparing for more than a year for the challenging task of deploying Chandra with its Inertial Upper Stage booster. We've had the pleasure of working with a fine team of instructors, flight controllers, engineers, scientists, pilots, managers, and all the other key people in this program.***
>
> – Eileen Collins

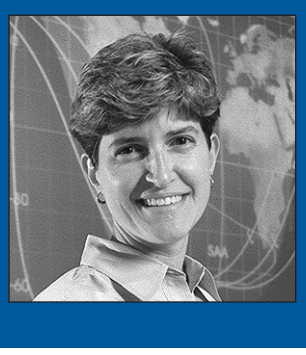
STS-93 will be commanded by Eileen Collins, the first woman to command a shuttle flight. It will be her third mission.

"I am proud to have the opportunity to command this mission," said Collins. "My crew and I have been preparing for more than a year for the challenging task of deploying Chandra with its Inertial Upper Stage booster. We've had the pleasure of working with a fine team of instructors, flight controllers, engineers, scientists, pilots, managers, and all the other key people in this program. This is a very strong and dedicated team. All their efforts will come together as the Chandra X-Ray Observatory brings us closer to understanding this universe we live in."

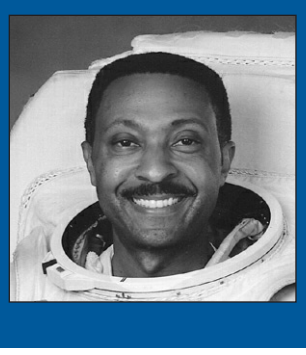
The pilot is Jeff Ashby, making his first flight. Mission specialists are Steve Hawley, on his fifth flight; Catherine Coleman, making her second flight; and Michel Tognini of CNES, the French Space Agency, on his second flight. The mission is to last just under five days.

A fourth great observatory, the Space Infrared Facility, is scheduled for launch in 2001. ■

Staying a Star, now that JSC is one. **Page 2**



New ascent flight dynamics officer certified. **Page 5**



Winston Scott Hall opens at McAuliffe. **Page 7**